22ITO71

Assignment - 5

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Internal Combustion Engines & Refrigeration and air conditioning Systems

1 Discuss comparison between IC and EC engine.

IC engine	EC engine
1 Name itself says that, Combustion take place inside the cylinder.	1. Name itself says that, Combustion take place outside the cylinder.
2 Temperature is higher.	2 Temperature is lower.
3. Pressure is higher.	3. pressure is lower
4. In IC engine, piston and connecting rod is used	4. In EC engine, staffing box is used.

2 Give classification of IC engine in detail.

1 **Nature of theamodynamic cycle as :**
- 1) Atto cyle engine
- 2) Diesel cycle engine
- 3) Dual combustion cycle engine

2. **Type of the fuel used :**
- 1) petrol engine
- 2) Diesel engine
- 3) Gas engine
- 4) Bi - fuel engine

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3. Number of stokes as :
   1) four stroke engine
   2) Two stroke engine

4. method of ignition as :
   1) spark ignition engine, known as SI engine.
   2) compression ignition engine, known as CI engine.

5. Number of cylinder as :
   1) Single cylinder engine
   2) multi cylinder engine

6. position of the cylinder as :
   1) opposed cylinder engine
   2) Inclined cylinder engine
   3) V-shaped cylinder arrangement

7. According to the speed of the engine :
   1) slow speed engines
   2) Medium speed engines
   3) High speed engines

8. According to the cooling system :
   1) Air-cooled engines
   2) Water-cooled engines

3 Enlist different component of I.C. engine and explain function of Connecting rood, carburetor, fuel centers, clearance volume, stroke volume and stroke length, fuel pump, fuel injector and spark plug.

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→ 1. Cylinder block
2. Cylinder head
3. Piston
4. Piston rings
5. Connecting rod
6. Crankshaft
7. engine bearing

⇒ **Connecting rodd** :

- Connecting rod mechanism transferms reciprocative motion to rotational motion.

⇒ **Carburetor** :

- A carburetor is a device used by an internal combustion engine to control and mix air and fuel entering the engine.

⇒ **Fuel pump** :

- The purpose of a car fuel pump is to convey the required quantity of fuel from the tank to the engine at the necessary pressure.

⇒ **Fuel injector** :

- A fuel injector is a device from atomizing and injecting fuel into an internal combustion engine

⇒ **Spark plug** :

- your spark plugs are what supply the spark that ignites the air / fuel mixture, creating the explosion, which makes your engine produce power.

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4 Explain dead centers, clearance volume, stroke volume and stroke length with suitable figures.

→ The dead center is the position of an engine's piston when it is at very top or bottom of its stroke.

⇒ **clearance** :-

- The hole is larger than the shaft, enabling the two parts to slide and rotate when assembled.

⇒ **stroke Volume** :-

- Engine displacement is calculated by multiplying the cross-section area of the cylinder by the stroke length.

⇒ **stroke length** :-

- The stroke length is low for the piston travels in the cylinder.

5 Describe the all the four strokes of four stroke single cylinder petrol engine with suitable figures.

1] **Intake**

→ Also known as Internal or Suction.

→ This stroke of the piston begins at top dead center (T.D.C.) and ends at bottom dead center (B.D.C.).

→ In this d stroke the intake valve must be in the open piston while the piston pulls an air-fuel mixture into the cylinder by producing a practical vaccume in the cylinder through

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its downward motion.

2] Compression

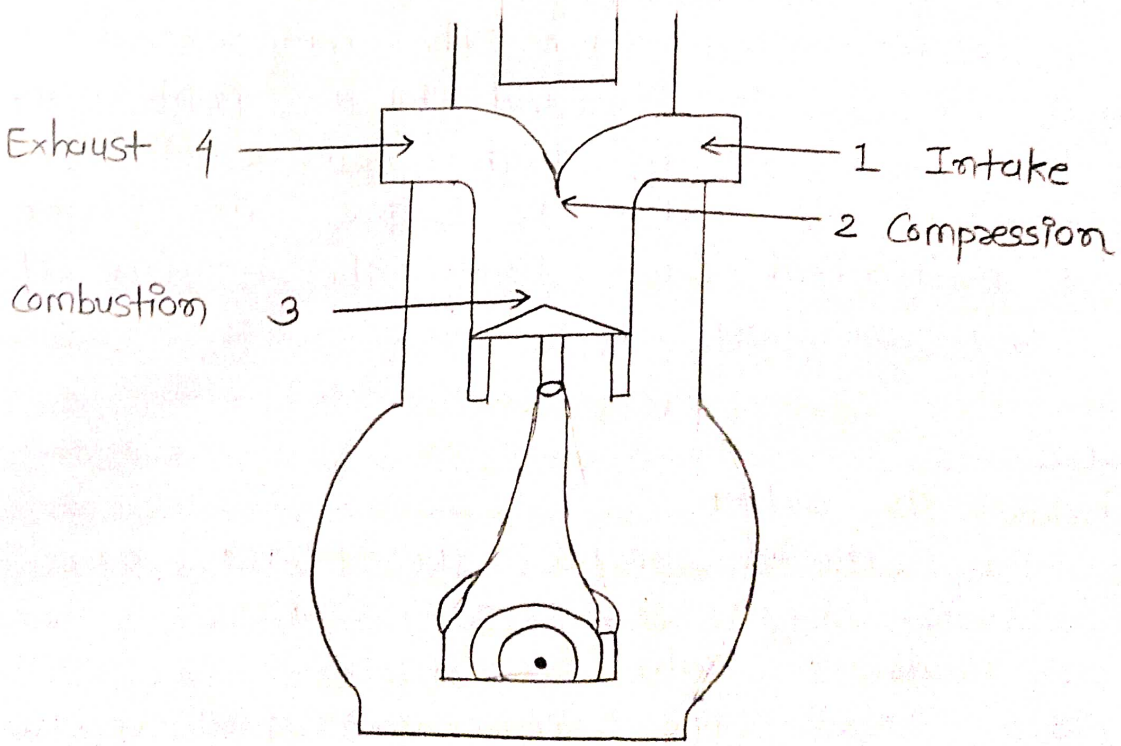
→ This stoke begins at B.D.C. or just at the end of the suction stoke and ends at T.D.C.
→ In this stoke, the piston compresses the air fuel mixture in preparation for ignition during the power stoke.
→ Both the intake and exhast valves are close during this stage.

3] Combustion

→ Also known as power or ignition.
→ This is the start of the second revolution of the four stoke cycle.
→ At this point, the crankshaft has completed a full 360 degree revolution.
→ While the piston is at T.D.C. the compressed air-fuel mixture is ingnited by a spark plug or by heat generated by high compression, for returning the piston to B.D.C. This stoke produces mechanical work from the engine to turn the crankshaft.

4] Exhaust

→ Also known as outlet.
→ During the exhaust stoke, the piston, once again, returns from B.D.C. to T.D.C.
→ While the exhaust valve is open.
→ This action expels the spent air-fuel mixture through the exhaust port.



single cylinder petrol engine

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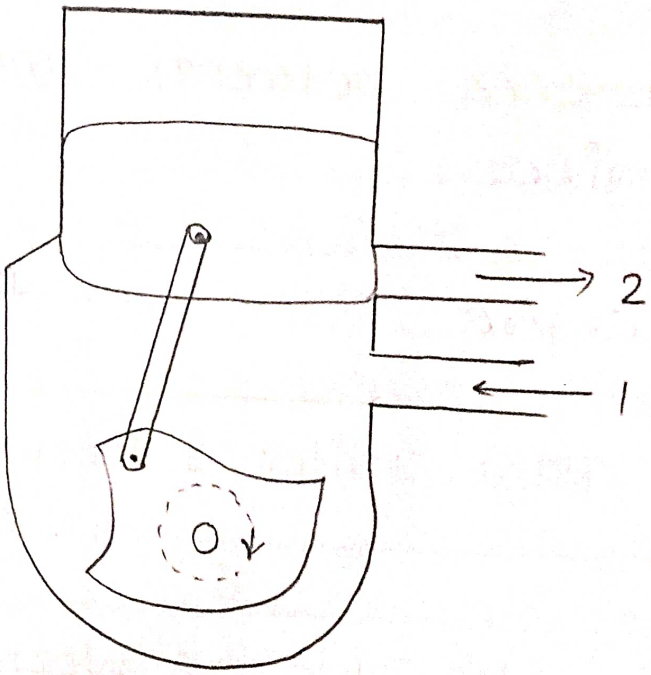
6 Give the difference between working of petrol and diesel engine.

petrol engine	diesel engine
1. known as spark ignitor engine.	1 known as compression ignitor engine.
2 Work on the otto cycle.	2. Work on diesel cycle.
3. Air and the fuel are mixed in a carburetor	3 The fuel is mixed with air inside the cylinder.
4. Fuel is ignited with an electric spark.	4. Ignition is achieved with the help of the hot, compressed air.
5. Relatively low compression ratio.	5 High Compression Ratio.

7 Explain with neat sketch working of 2 stroke single cylinder diesel engine.

→ **Down stroke** :-

- The piston moves from T.D.C. to B.D.C. letting the fresh air enter the combustion chamber.
- The fresh air - fuel mixture gets into the combustion chamber through the crankcase.
- In this stroke, the crankshaft markes rotation of 180°.



2 - stooke single cylinder

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⇒ **Up stroke** :-

- The piston is pushed from B.D.C. to T.D.C.
- As a result, the fuel-air mixture gets compress and the spark plug ignites the mixture.
- The mixture expends and the piston is pushed down.
- The inlet part is open during the upstroke.
- While the inlet part is opened, the mixture gets sucked inside the crankcase, when the mixture is pushed up into the combustion chamber during the previous upstroke, a partial vacum is created as no mixture is left behind in the crankcase.
- The mixture is ready to go into the combustion chamber during downstroke but remains in the cranksa until the position goes up to T.D.C.
- In this stroke, the crankshaft marks the rotation of 180°.

8 Difference between four stroke and two stroke I.C. engine.

Four stroke engine	Two stroke engine
1] It has two revolutions of the crankshaft during one power stroke.	1] It has one revolution of the crankshaft during one power stroke
2] It generates less torque.	2] It generates high torque
3] It uses valves for the fuel's outlet and inlet	3] It uses a port for the fuel's outlet and inlet

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4] Its engines result in higher thermal efficiency	4] Its engines result in lesser thermal efficiency
5] It has a larger ratio in terms of power to weight.	5] It has a lesser ratio of power to weight.
6] Requires more lubricating oil as some oil burns with the fuel.	6] Requires less lubricating oil.

9 Justify the statement "Power developed by two stroke engine is more than four stroke engine."

→ A two stroke engine can produce more power output for the same cylinder dimensions compared to a four stroke engine due to its higher combustion efficiency and faster combustion process.

10 Why the diesel engine cars are more costly than petrol engine cars ?

→ A diesel generators more heat unlike a petrol engine, a diesel doesn't have spark plugs to ignite the fuel-air mixture.

→ The ignition happens when it intakes air and compresses it.

→ The heat of the compressed air lights the fuel, explains Raman.

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11 "Two stroke engines are lighter in weight and compact in size compare to four stroke engine.", is the statement true ? If it is true then give the reason.

→ True.

→ Because a 2-stroke engine creates more torque at a higher RPM, while a 4-stroke engine creates a higher torque at lower RPM.

12 Give the application of refrigeration

→ Preservation of perishable food products.

→ food processing

→ storing and transportation by storing them at low temperature.

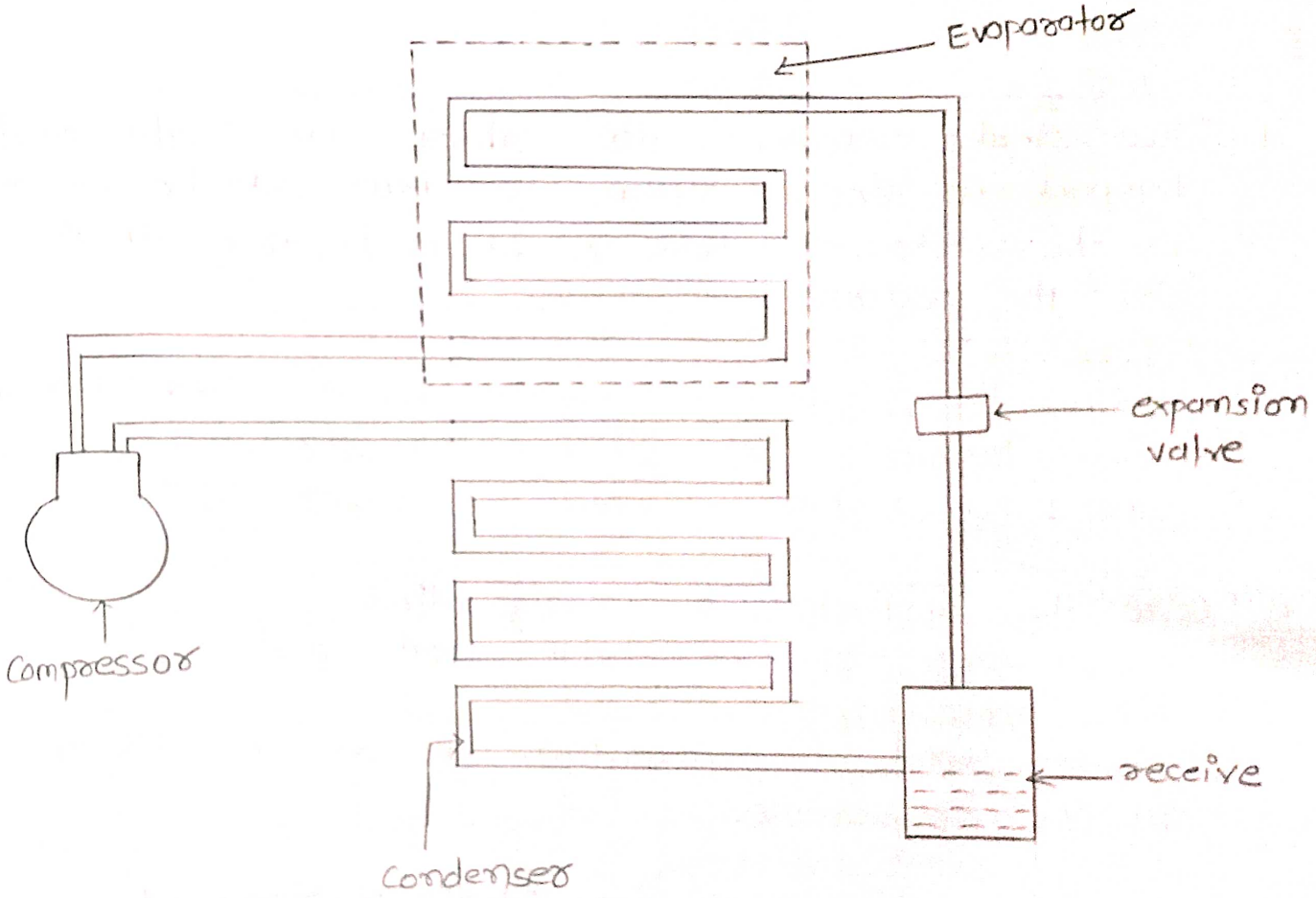
13 Write the properties for ideal refrigerant

→ An ideal refrigent should be
non-toxic,
non-flammable,
have no effect on food products &
should not react with atmospheric air.

14 Define refrigeration and explain the working of vapour compression refrigeration cycle with suitable diagram.

→ Vapour compression refrigeration cycle Vapour compression refrigeration cycle consist of four different processes :-

1) Compression
2) Condensation
3) expansion
4) evaporation Components and its function.



Vapour Compression refrigeration cycle

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1 **Compressor** :-

→ The low pressure & Temperature refrigerant from evaporator is drawn into compressor.

→ It is Compressed to a high pressure & high temp. Vapour refrigerent is discharged into Condenser.

2 **Condenser** :-

→ High pressure and temperature vapour refrigerant is cooled and condensed by using air or water & form liquid Vapour refrigent. Heat is rejected.

3 **Expansion Valve** :-

→ To Control flow of refrigenet and reducing it pressure and temperature.

4 **Evaporator** :-

→ Liquid Vapour refrigerant at low-

→ pressure and low Temperature is evaporated by absorbing heat from system or substance and change into vapour refrigent.

15 Define Refrigeration effect, a ton of refrigeration and co-efficient of performance.

1 **Refrigeration effect** :

→ Refrigeration effect is an important term in refrigeration that defines the amount of cooling produced by a system.

→ This cooling is obtained at the expense.

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2. **Ton of refrigeration :**

→ Ton of refrigeration, also called a refrigeration ton (RT), is a unit of power used in some countries to describe that extraction capacity of Refrigeration and air conditing equipment.

3. **co-efficient of performance :**

→ C.O.P. is defined as the relationship between power (kw) that is draw out of the heat pump as cooling or heat, and the power (kw) that is supplied to the compressor.

16 Explain principle of air conditioning and give two main application of air Conditioning.

→ As the liquid refrigent inside the evaporator coil converts to gas, heat from the indoor air is absorted into the Refrigent, thus cooling the air as it passes over the coil.

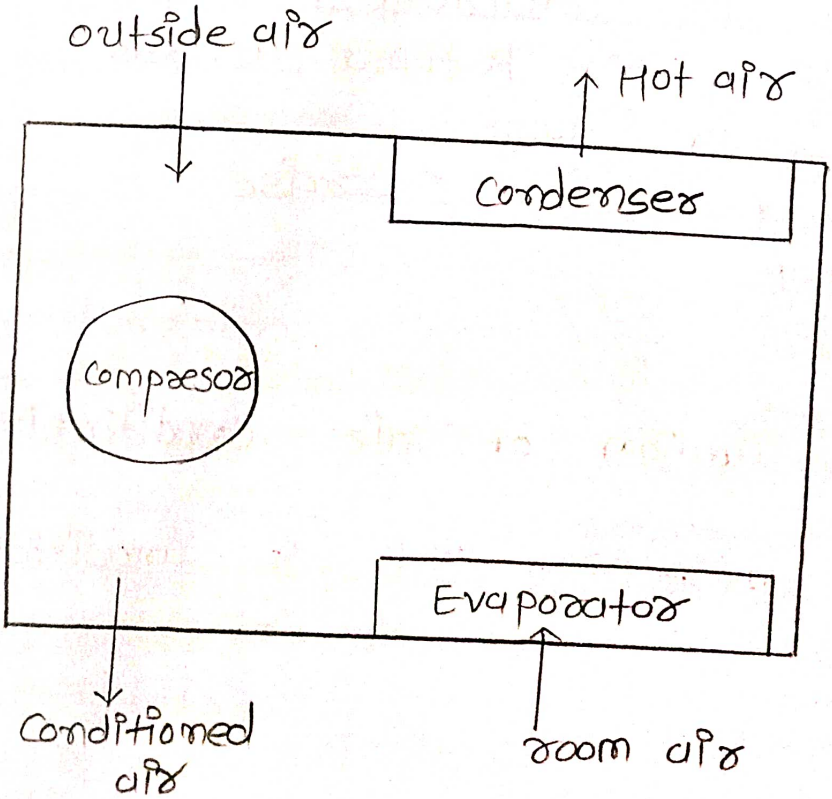
⇒ **Application of air conditioning :-**

1) Reduced posibility of Asthma attacks
2) A more secure Home
3) Cool Home place for excercise
4) Better sleep

17 Give the classification of air conditioning system in detail.

→ There is a classification of air conditioning system.

⟹ Window air conditioner



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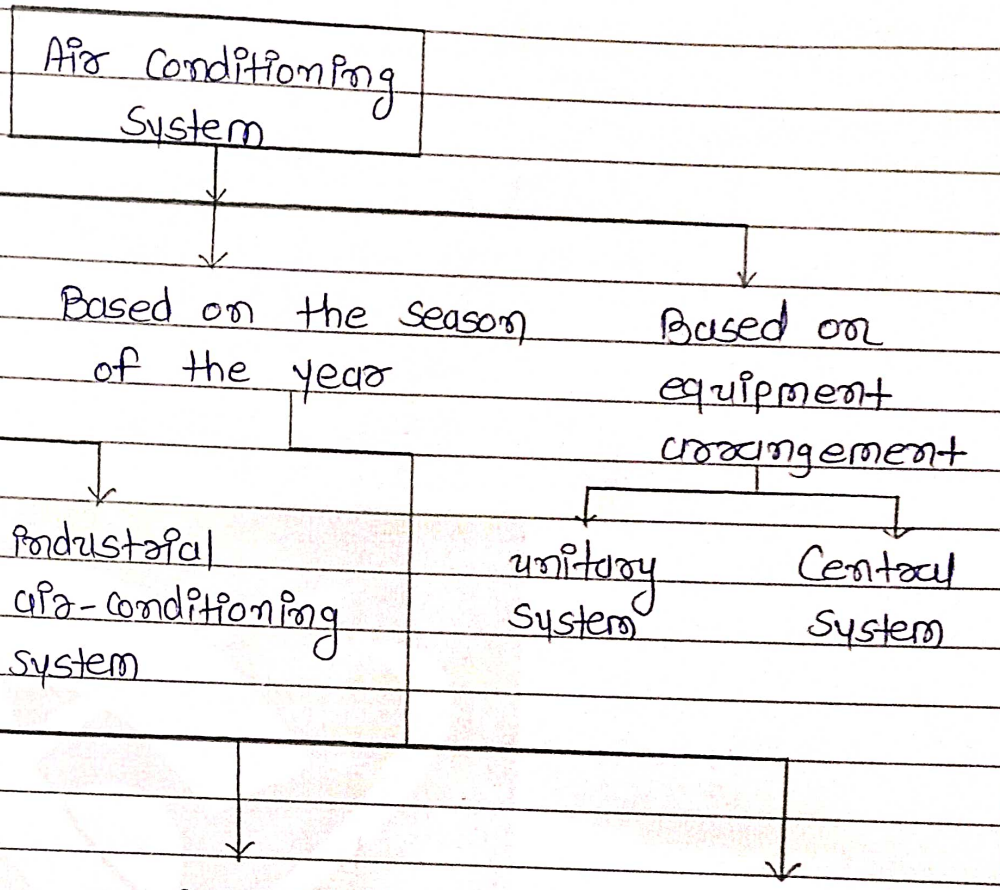

18 Explain working of window air conditioner with diagram.

→ The low pressure and low Temperature refrigerant vapour from evaporator is sucked by compressor.

→ The compressor, the vapour to high pressure and high temperature and discharges into the Condenser on the condenser the refrigerent vapour Condenses by dissipelting heat to the cooling medium the liquid refrigerent Cooling out of Condenser passes through filter, drayer into capillary tube where it is again thrcated back to the evoparated pressure.

→ The low pressure low temperature liquid refrigerent then flows to evoparator which it boil off by

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extracting heat from air to be circuited to the conditional space.

19 What are the advantages of split A.C over window A.C. ?

→ The main advantage of split ac is that it can be installed almost anywhere without blocking window / daylight.

→ As its condenser unit is placed outside, the indoor unit generates petty low noise inside the conditioned space.

→ It gives air pattern and hence uniform cooling across the room.

20 Explain domestic Vapour Compression refrigerator.

→ As the refrigerent circulates through the system, it is alternately compressed and expanded, changing its state from a liquid to a vapour.

→ As the refrigerant changes state, heat is absorbed and expelled by the system, lowering the temperature of the conditional space.